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WHITE RIVER DRAINAGE BASIN

Public Health Service
Little Rock, Arkansas

April 1953

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REPORT ON WATER POLLUTION

WHITE RIVER BASIN

April 1953

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Division of Water Pollution Control
Southwest-Lower Mississippi Drainage Basins Office

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SUMMARY

The White River Basin encompasses an area of 27,765 square miles extending over the south central portion of Missouri and northern Arkansas. About 34 percent of the drainage area is in Missouri, and 66 percent is in Arkansas. The main stem of the White River drains about two-thirds of the basin area; and the Black River, the main tributary stream, drains the remaining one-third of the area (8,675 square miles) in the northeastern portion of the basin.

The major portion of the basin is characterized by the mountains and highlands of the Ozark Plateau. The eastern fringe area and the lower reach of the White River valley extend into the wide fertile lands of the Mississippi Alluvial Pla

The average annual rainfall over the entire basin is about 46 inches; the average varies from 42 inches in Missouri to about 52 inches in the lower river valley region. Heavy seasonal rains and high run-off characteristics of the Ozark Plateau Region produce damaging floods along many of the streams. Yearly distribution of rainfall, however, assures adequate minimum flows in most streams throughout the year.

The total estimated population in the basin, based on the 1950 U. S. Census, was 772,000. About two-thirds of the population is in Arkansas, and one-third is in Missouri. The entire basin area is generally sparsely populated; relatively higher concentrations are found throughout the eastern counties.

Agriculture is one of the principal economic activities of the region. Poultry, fruits, vegetables, and forage crops are the principal products raised in the upland areas. Rice, other cereal grains, forage crops, and cotton are raised in the fertile lands of the lower basin area. Livestock raising is common over the entire basin.

Numerous small industries engaged in processing the local agricultural products are distributed throughout the basin. These industries include canneries, meat and poultry packing plants, and milk processing plants. Other industries include zinc, lead and manganese mining, limestone quarrying, and manufacture of lime, fertilizer, chemicals, and storing and drying of rice.

The water resources of the basin are used principally for public and industrial water supplies; agriculture; fish and wildlife propagation; bathing and other forms of recreation; production of hydroelectric power; navigation; and for final disposal of wastes.

There are 68 municipal water supplies in the basin serving approximately 126,500 persons with an average of 10.8 m.g.d. of water. Fifteen public supplies serving 48,500 persons with 5.0 m.g.d. obtain water from surface sources including springs. Fifty-four supplies serving 78,000 persons with an average of 5.8 m.g.d. obtain water from underground sources.

Many small-scale industries obtain their water supplies from municipal systems. Several larger industries have privately owned well supplies and some use springs.

Water for irrigation of the extensive rice-growing areas in the lower river valley is derived mostly from underground sources. Livestock use streams, impoundments, and other surface sources for watering purposes.

Topography and stream characteristics are favorable for hydroelectric power development projects. Two large multipurpose dams have been constructed for flood control and power production. Three smaller and older dams produce run-of-the-river hydroelectric power. Some of the existing impoundments have storage capacity for flood control; a number of additional dam projects have been proposed for construction throughout the basin.

The streams and impoundments in the White River Basin are noted for the many recreational opportunities they offer. Sport fishing, hunting, bathing, boating, and camping opportunities attract numerous vacationers and visitors to the area, and provide a significant source of income for the region.

Pollution of the surface waters within the basin is not considered extensive compared to many other streams in the southwest. Wastes from municipal sources and from numerous small-scale industrial plants, including canneries, meat and poultry packing plants, and milk processing plants present pollution problems which are generally confined to local areas.

There are 46 municipalities with sewerage facilities serving 152,800 persons in the basin. The combined pollution load produced by the sewered population and known industries discharging wastes into municipal sewer systems is equivalent to the wastes produced by 177,000 persons (population equivalent). Waste treatment reduces the total pollution load to 70,000 population equivalents, representing a reduction of 60 percent. Industries in the Missouri portion of the basin only are included in the estimate of total pollution load produced in the basin. Data on pollution loads produced by industries in Arkansas are undetermined.

Thirty-six municipalities have waste treatment plants serving a sewered population of 129,400. Of the total number, 20 are primary

plants; 19 are in Arkansas and one is in Missouri. Sixteen are secondary plants; nine are in Arkansas and seven are in Missouri. Primary plants serve about 26 percent of the total population served by treatment plants, and secondary plants serve about 74 percent. Ten municipalities with a sewered population of 23,400 have no waste treatment plants.

Of the 36 existing municipal waste treatment plants, 17 (14 in Arkansas and three in Missouri) are reported inadequate from the standpoint of capacity or other physical plant features. Seventeen plants, 14 in Arkansas and three in Missouri, are not operated satisfactorily.

Progress in the abatement of pollution may be measured by the number of new treatment works constructed. New plants have been constructed or major improvements to existing plants have been made in 14 municipalities since 1946.

Additional municipal pollution abatement facilities needed in the basin include: new plants to serve 21,200 persons in eight municipalities, six in Arkansas, two in Missouri; enlargements or additions to eight existing plants serving 67,500 persons, six plants in Arkansas, two in Missouri; replacement of nine existing plants serving 14,700 persons, eight plants in Arkansas and one in Missouri; and the needs for two small communities, one in Arkansas and one in Missouri, are undetermined. Fourteen municipalities in Arkansas and five in Missouri do not need projects.

The status of action on needed municipal waste treatment projects shows that three projects are under construction; three are in the active planning stage; two have final plans approved; and no action is being taken on 17 projects.

Data regarding sources of industrial pollution discharged directly to the watercourses of the basin are relatively incomplete. Sufficient information is available, however, on 87 known industries to indicate the status of the industrial waste pollution problem in the basin.

Eighty-five of the known industrial plants produce organic type wastes associated with the processing of food and kindred products. Two fertilizer manufacturing plants produce inorganic wastes containing fluoride and sulfuric acid. There is no evidence that these wastes have seriously affected the quality of any important stream where chemical quality tests have been made. Of the 87 industries reported, only 20, including two fertilizer plants, have waste treatment facilities.

Pollution abatement needs for sources of industrial wastes include 20 new treatment plants, two enlargements or additions to existing plants and one replacement of an existing plant. The waste treatment needs for 57 industries are undetermined. Eight industries have adequate waste treatment facilities. The status of action on needed projects shows that

final plans have been approved for one project; no action has been initiated on 16 projects; and the status of 62 projects is undetermined.

Water pollution control activities in Arkansas are administered by the Water Pollution Control Commission established within the State Board of Health in 1949. The existing State anti-pollution statutes and laws pertaining to financing of waste treatment plants are regarded as adequate for control of stream pollution problems in the basin. The State Fish and Game Commission is also active in the enforcement of the laws for control of pollution affecting its interests.

In Missouri, the Division of Health exercises certain control over stream pollution through the broad powers delegated to the Director of the Department of Public Health and Welfare. Additional legislation has been under the jurisdiction of the Conservation Commission. Inadequate enforcement provisions of existing regulations and laws, however, have hampered the water pollution control activities in the State. Deficiencies in the present statutes are recognized and several conservation groups are actively promoting passage of needed supplemental legislation.

Estimates based on available cost data indicate that the initial cost for providing needed municipal waste treatment facilities in the basin will be approximately $2,500,000. Considered in the estimate is the cost for providing treatment of industrial wastes discharged into municipal sewer systems in the Missouri portion of the basin only. The estimate, however, does not include the cost of projects needed by industries discharging wastes directly to the watercourses.

CONCLUSIONS

(1) The surface waters of the White River Basin are abundant in quantity and generally of good quality. Underground water resources are generally limited and are of variable mineral quality throughout the basin.

(2) The water resources are used primarily for municipal and industrial water supplies; irrigation; livestock watering; production of hydroelectric power; propagation of fish, wildlife, and shellfish; recreation; navigation; and for final disposal of wastes. The many and varied uses made of the waters emphasize the importance of pollution control to safeguard the beneficial uses of the waters in the basin.

(3) Pollution of the surface waters throughout the basin is not extensive. Wastes discharged from municipalities and numerous small industries produce pollution conditions which in most cases do not seriously affect downstream uses.

(4) Seventy-eight percent of the sewered municipalities, representing 85 percent of the total connected population, provide for some type of treatment of their wastes. About 49 percent of the existing waste treatment plants are inadequate and require improvements or replacements; 49 percent need improved operation.

(5) Significant progress in abatement of pollution in the basin is evidenced by the construction of 14 municipal waste treatment plants during the past seven-year period. Incomplete information precludes an evaluation of the progress made regarding measures provided for abatement of pollution from industrial sources.

(6) Maximum benefits can be derived from existing waste treatment plants and new facilities by expanding the program activities of the responsible state agencies to provide for more complete surveillance of plant operation and to increase activities for training of plant operators.

(7) The deficiencies of information and gaps in data indicated throughout the report are as significant as the presentation of available facts and statistics. They indicate the work which still needs to be accomplished by water pollution control authorities to define completely the scope of the problems, especially as affected by sources of industrial pollution.

(8) Existing water pollution control legislation in Missouri and funds appropriated for the responsible control agencies are inadequate for the promotion of recognized pollution abatement program activities.

(9) Existing water pollution control legislation in Arkansas is regarded as adequate for the administration of a comprehensive pollution abatement program in the basin. Insufficient funds, however, have seriously hampered the program activities of the State Water Pollution Control Commission.

(10) A preliminary estimate, based on available data, indicates that the initial cost for providing needed municipal waste treatment facilities in the basin will be approximately $2,500,000. It is reasonable to assume that re-evaluation of needs, when more complete data become available, may change the estimate appreciably. The estimate does not include consideration of cost for providing needed industrial waste treatment facilities.

RECOMMENDATIONS

It is recommended that:

(1) Continued efforts be made by the responsible state water pollution control agencies to secure supplemental data, particularly on industrial waste pollution, for the purpose of defining the problems more completely and to permit evaluation of needs for instituting reasonable corrective measures.

(2) Municipalities and industries assume their responsibility for abating pollution in the waters of the basin and initiate construction of needed waste treatment projects.

(3) Adequate water pollution control legislation be adopted by Missouri to facilitate enforcement of present regulations and laws and support the responsible agencies in the development of comprehensive programs for pollution abatement.

(4) The State legislatures of Missouri and Arkansas appropriate funds commensurate with the responsibilities of their designated water pollution control agencies to permit continued and expanded program activities.

(5) In order to derive full benefit from existing pollution abatement facilities, expanded program activities of the individual States should provide for more complete surveillance over operation of waste treatment plants and, through training courses, make available trained and competent plant operators.

(6) Public educational programs sponsored by the state health departments be expanded as a means of publicizing the extent of pollution in the basin, and informing the public of the damages resulting from pollution and benefits to be derived from pollution abatement.

PHYSICAL DESCRIPTION

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The White River arises in the Boston Mountains in northwestern Arkansas near Fayetteville and flows in a northerly direction into Missouri. It continues in an easterly direction through southern Missouri for about 100 miles where it flows in a generally southeasterly direction, returning into Arkansas and joining the Mississippi River about 45 miles above Arkansas City. The stream is approximately 640 miles in length and embraces a drainage area of 27,765 square miles. Its principal tributary, the Black River, with a drainage area of 8,675 square miles, arises in the Ozarks and joins the White River near Newport, Arkansas. Other principal tributaries are the James, Buffalo, North Fork, Little Red, and Cache Rivers.

Approximately 75 percent of the drainage basin of the White River and tributaries is situated in the Ozark highlands. The watershed is divided into the Ozark Highlands and the Mississippi Alluvial Plain by a well-defined escarpment running in a general southeasterly direction from near Hodges Ferry, Missouri, to the vicinity of Cabot, Arkansas. The Ozark region is formed by the Boston Mountains on the north and the Ozark Plateau on the south. The elevation of the White River at its source is about 1,800 feet. The slope of the stream averages about four feet per mile to the vicinity of Batesville, Arkansas, and from there it slopes about 0.36 feet per mile. The highlands range from moderately hilly to rugged topography. The major portion of the area is underlain by massive beds of limestone and dolomites which are honeycombed with caves. A thick bed of St. Peter sandstone underlying southeastern Missouri is sufficiently pure to use in glass production.

Climate and Hydrologic Features

Climate varies greatly as would be expected in an area extending through four degrees of latitude.

Temperatures range from an annual average of 63° F. in the south to 58° F. in the northern portion of the basin. Winters are generally short, and summers are long in the southern portion of the basin.

The average annual precipitation ranges from 52 inches in the south to 44 inches in the northwest and 42 inches in the northern part of the basin. The distribution of the rainfall and the long frost-free season are favorable for agriculture. Months of highest average rainfall are April, May, June, and January; and those of the lowest average precipitation are February, October, November, and December.

Runoff averages about 16 inches over most of the basin area. The streams in the upper basin are swift and flow in deep narrow channels. Recorded average annual stream flow, runoff per square mile, and maximum and minimum monthly discharges are shown in Table 1.

ECONOMIC DEVELOPMENT

Population

The 1950 population in the basin was estimated at 773,000. Principal communities in Arkansas and their populations are: Fayetteville - 17,024; Jonesboro - 16,260; Stuttgart - 7,094; Batesville - 6,371; Newport - 6,262; Searcy - 6,002; and Harrison - 5,545. Principal communities in Missouri are: Springfield - 66,302; Poplar Bluff - 15,120; West Plains - 4,923; Thayer - 1,632; and Doniphan - 1,612.

Industry and Land Use

Agriculture is the main occupation in the basin. It is supplemented by manufacturing and mining. The best soils are found in the alluvial plain in the lower portion of the basin. In the headwaters areas, the soils are poor and the rough terrain render the land unsuitable for farming. Orchards and small fruits and vegetables are grown and poultry and livestock raised in the uplands regions.

Portions of Clark, Mark Twain, and Ozark National Forests lie within the upper basin. The uplands regions are attractive as recreational areas and are being developed for this purpose. Many food processing plants including canneries, frozen foods, milk products, egg drying, poultry dressing, and meat packing plants are dispersed throughout the region. Wood products, shoes, chemicals, lime, and fertilizer are manufactured. Marble and limestone quarries are worked in southeastern Missouri, and glass sand is produced near Batesville. Lead, zinc, and manganese are mined in the Ozark Plateau. Many small industries of a variety of types which can operate economically in the small towns are found throughout the basin. The industrial processes needed to prepare the products of the region for economic marketing are carried on near the sources of production.

TABLE 1

WHITE RIVER BASIN

STREAM FLOW DATA

Watercourse - Gaging Station	Drainage Area (sq. mi.)	Average Annual Discharge		Monthly Discharge	
		c.f.s.	c.f.s./ sq. mi.	Maximum c.f.s.	Minimum c.f.s.
White River					
Beaver, Arkansas	1,238	1,621	1.3	13,400	5.1
Batesville, Arkansas	11,062	12,950	1.2	100,400	912
Newport, Arkansas	19,812	24,740	1.2	164,200	4,020
Clarendon, Arkansas	25,497	30,160	1.2	215,000	3,230
James River					
Galena, Missouri	987	998	1.0	9,549	28.5
Buffalo River					
Rush, Arkansas	1,091	1,372	1.3	12,140	19.6
North Fork River					
Tecumseh, Missouri	1,157	1,258	1.1	8,010	310
Black River					
Poplar Bluff, Missouri	1,245	1,303	1.1	7,741	273
Black Rock, Arkansas	7,323	8,387	1.2	50,920	2,136
Current River					
Doniphan, Missouri	2,038	2,757	1.4	16,100	980
Spring River					
Imboden, Arkansas	1,162	1,409	1.2	7,265	291
Little Red River					
Heber Springs, Arkansas	1,141	1,870	1.6	13,170	0

USES OF WATER RESOURCES

The types of economic activities existing in the basin are controlled primarily by natural resources with some control exercised by climate, topography, and rainfall. Principal uses of water in turn reflect the economic activities of the basin. The water uses considered pertinent to the subject of water pollution control in the basin include municipal and industrial supplies, power generation, livestock watering, irrigation, recreation, game fishing, commercial fishing, propagation of wildlife and shellfish, bathing, boating, navigation, and waste disposal. Map No. 1 shows the primary water uses in the basin.

Surface waters in the basin are abundant in quantity and excellent in quality for municipal and industrial supplies. All the public water supplies in Arkansas and Missouri using surface waters are in or near the edge of the Ozark Plateau.

Underground water supplies in the basin come from three distinct types of ground water strata. The lower portion of the basin, situated in the Mississippi Alluvial Plain, contains unconsolidated and semi-consolidated aquifers which produce fairly large quantities of water of suitable quality. However, some wells in the area contain excessive amounts of iron, manganese, and/or hardness. The quantity of water available in some areas is limited. In parts of the basin, where irrigation of rice fields is practiced, the ground water table has been lowered so much that some wells had to be abandoned.

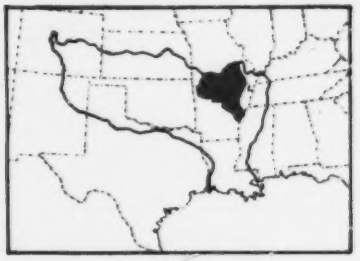
In the Ozark Plateau area, the ground water strata consists of consolidated rock aquifers, which generally produce satisfactory yields for the type of demand consisting mostly of domestic supplies for small communities or small industrial supplies. Quality is generally good with undesirable hardness, iron, and manganese found in a few localities.

In a small area in the west central portion of the basin lying in the Ozark Plateau, there is no known aquifer that will yield as much as 50 g.p.m. per well.

It is apparent that with expanding agricultural and industrial activities and growth of urban areas in this basin, greater demands will have to be supplied from surface water resources.

Municipal Water Supplies

Table 2 shows a summary of the municipal water supplies obtained from surface and ground water sources in the basin. There are 68 municipal water supplies in the basin serving approximately 126,500 people



LEGEND

- DOMESTIC
- INDUSTRIAL
- LIVESTOCK
- GAME FISHING
- WILDLIFE
- COMMERCIAL FISHING
- OTHER RECREATION
- NAVIGATION
- IRRIGATION
- SHELLFISH
- BATHING

WHITE RIVER BASIN

EXISTING PRIMARY WATER USES

FEDERAL SECURITY AGENCY
Public Health Service
Division of Water Pollution Control
MAP NO. 1

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TABLE 2

WHITE RIVER BASIN

MUNICIPAL WATER SUPPLIES

Municipality	Population Served (1950)	Average Output M.G.D.	Average Consumption gals./cap./day	Source	Type of Treatment*
		From Surface Water Sources			
ARKANSAS					
Bald Knob	(1,800) 1/			Searcy	See Searcy
Batesville	6,300	.49	77	White River	P
Berryville	1,500	.09	60	Springs	D
Eureka Springs	2,600	.10	38	Leatherwood Creek	P
Fayetteville	7,500	.32	110	West Fork White (Imp.) 2/	P
Hardy	400	.02	50	Spring River	P
Harrison	6,000	.60	100	Spring	D
Heber Springs	1,500	.16	106	Little Red River	P
Huntsville	950	.04	42	War Eagle River	P
Judsonia	(1,400) 1/			Searcy	See Searcy
Melbourne	500	.02	40	Spring	D
Newport		See well supplies		White River (Emerg.)	P
Pocahontas	4,000	.36	90	Black River	P
Searcy	8,200	1.00	121	Little Red River	P
MISSOURI					
Poplar Bluff	9,000	1.25	139	Black River	P
TOTAL	48,450	4.95	102		

1/ Included in Searcy population served.

2/ Two impoundments supply Fayetteville. One is in the White River Basin; one in the Arkansas River Basin. Estimated half of population and half of the water supplied from White River. Population and output shown are half of totals.

TABLE 2 (Cont'd)

WHITE RIVER BASIN

MUNICIPAL WATER SUPPLIES

Municipality	Population Served (1950)	Average Output M.G.D.	Average Consumption gals./cap./day	Source	Type of Treatment *
		From Ground Water Sources			
ARKANSAS					
Augusta	1,800	.15	83	Wells	DK
Beebe	1,500	.08	53	Well	None
Bradford	750	.03	40	Well	I
Brinkley	3,700	.15	40	Well	I
Cabot	1,600	.06	37	Well	None
Calico Rock	1,200	.07	58	Well	I
Clarendon	2,600	.11	42	Well	IK
Corning	1,700	.13	76	Well	None
Cotter	1,000	.03	30	Well	PI
Cotton Plant	1,000	.07	70	Well and spring	I
Des Arc	1,500	.05	30	Well	I
De Valls Bluff	600	.02	33	Well	D
Elaine	550	.19	35	Well	None
Green Forest	700	.03	43	Well and spring	D
Hazen	850	.045	53	Well	I
Holly Grove	600	.05	83	Well	None
Jonesboro	20,000	1.7	85	Well	D
Kensett	500	.035	70	Wells	I
McCrory	920	.04	43	Wells	I
Mammoth Springs	675	.035	51	Wells	D
Marshall	1,200	.04	33	Well and spring	I
Marvell	950	.05	53	Well	D
Mountain Home	2,500	.125	50	Wells	D
Mountain View	300	.01	33	Well	None
Newport	6,000	.50	83	Well (White River emerg.)	I
Tuckerman	800	.04	50	Well	I
Walnut Ridge	2,000	.21	105	Well	I

TABLE 2 (Cont'd)

WHITE RIVER BASIN

MUNICIPAL WATER SUPPLIES

Municipality	Population Served (1950)	Average Output M.G.D.	Average Consumption gals./cap./day	Source	Type of Treatment *
		From Ground Water Sources (Continued)			
MISSOURI					
Ash Grove	150	.030	200	Well	None
Ava	1,250	.125	100	Well	None
Billings	250	.108	432	Well	None
Birch Tree	250	.072	288	Well	None
Branson	600	.025	41	Well	None
Cabool	1,000	.100	100	Well	None
Cassville	1,150	.066	57	Well	None
Crane	800	.042	52	Well	None
Doniphan	1,600	.175	109	Impoundment well	D
Ellington	350	.010	29	Well	None
Ellsinore	50	.001	200	Well	None
Forsyth	280	.008	29	Well	None
Galena	425	.030	70	Well	None
Hollister	200	.025	125	Well	None
Koshkonong	100	.003	30	Well	None
Mansfield	700	.035	50	Well	None
Marshfield	1,200	.300	250	Well	None
Mountain View	520	.020	38	Well	None
Ozark	900	.070	78	Well	None
Piedmont	830	.050	60	Inf. gallery	D
Republic	680	.040	59	Well	None
Seymour	500	.025	50	Well	None
Thayer	1,300	.035	27	Well	None
Van Buren	320	.010	31	Inf. well	None

TABLE 2 (Cont'd)

WHITE RIVER BASIN

MUNICIPAL WATER SUPPLIES

Municipality	Population Served (1950)	Average Output M.G.D.	Average Consumption gals./cap./day	Source	Type of Treatment *
		From Ground Water Sources (Continued)			
Missouri (Cont'd)					
West Plains	3,600	.300	83	Well	D
Willow Springs	1,500	.075	50	Well	None
Winona				Well	None
Total	78,000	5.83	75		
Total (all sources)	126,450	10.78	85		

* KEY - Major Classification Type of Treatment
P - Purification (Coagulation, settling, filtration, disinfection)
I - Iron or Manganese Removal and disinfection
D - Disinfection only
K - Chemical treatment for corrosion correction or stabilization

with an average of 10.8 million gallons of water per day. There are two municipal water supplies serving approximately 6,500 people with an average of 0.6 m.g.d. which obtain water from springs. Thirteen water supplies, serving approximately 42,000 people with an average of 4.35 m.g.d., obtain water from surface sources other than springs. Fifty-four supplies, serving approximately 78,000 people with an average of 5.8 m.g.d., obtain water from underground sources.

Average per capita consumption for all water supplies is 85 gallons per day. The bulk of the water used is in towns with populations of 9,000 or less.

About 38 percent of the population served by public water supplies use water obtained from surface sources, and this group consumes about 46 percent of the water used by public water systems of the basin. Because of the almost perennial flow in streams rising in the Ozark area, very few systems obtaining supplies from major streams require impoundments to assure the necessary safe yield.

Industrial Water Supplies

Complete data on industrial water use for the basin are not available. For some industries, fairly detailed information has been obtained by field surveys of individual industries. Assuming that the available data represents a true cross-section of the basin's industry, it indicates that most industries are small-scale enterprises and the majority use public water supplies. The water requirements for most of the larger industries are included with municipal supplies listed in Table 2.

For most major industries and for many minor industries, the availability of good quality water at a low cost is an important consideration in the establishment of a new plant location. If a satisfactory surface supply is not available, an underground source must be obtained. It is usually economically infeasible to obtain the tremendous volumes of water required for large industries from underground sources and often well supplies are of undesirable chemical quality. Therefore, new industry will become more dependent upon surface waters.

None of the individual industries for which data are available use as much as one m.g.d. Representative of industrial water use in the basin are three of the larger industries for which water consumption data are available. One lumber mill in Arkansas uses about 285,000 g.p.d. from company-owned wells. One meat packing plant in Missouri uses 432,000 g.p.d. from company-owned wells; and one creamery in Missouri uses about 800,000 g.p.d. from a municipal system.

Power Generation

The White River and its tributaries are particularly well suited for the development of hydroelectric power projects in the portions of the basin outside the Mississippi Alluvial Plain. Factors favorable to hydroelectric projects found in the basin are: ideal dam and reservoir sites, fairly high river slopes, low sediment load in streams, and the fact that power development can be combined with flood control to form multiple purpose projects. Norfork Dam on the North Fork River and Bull Shoals Dam on the White River were built by the Corps of Engineers for flood control and power production. With the initial installation of power units, Norfork produces 174 million kilowatt-hours and Bull Shoals will produce 692 million kilowatt-hours annually. Five other dam and reservoir projects in the White River Basin have been approved by Congress for flood control or flood control and power generation.

Ozark Beach Dam on the White River near Forsythe, Missouri; a dam impounding the flow of Mammoth Springs; and a dam on Spring River near Mammouth Springs are run-of-the-river power dams owned by private power companies. These three projects have been operating for many years.

Further development of reservoir storage in the White River Basin will supplement the power which can be produced by existing projects because controlled releases will permit use of a greater percentage of runoff for power production. Use of hydroelectric power, in turn, aids in the conservation of other power-producing resources, but, at the same time, the reservoir created for power production may destroy valuable land and other resources.

Agricultural Uses

The Mississippi Alluvial Plain portion of the basin is used principally for growing rice and cotton. Irrigation is practiced widely for rice growing with most of the water obtained from wells.

Upland areas of the basin are used for livestock and poultry raising, growing small fruits, and vegetables. The limited areas in river alluvial plains near streams in the Ozark Plateau are used to grow grain crops, tobacco, and forage crops. Most reaches of the river in the Ozark Plateau portion are not suitable for irrigation because the character of the land in the valleys is not particularly adapted to irrigation. Stock water ponds, streams, and springs are important sources of livestock water.

Recreational Uses

The basin is outstanding for its large number of national forests,

wildlife preserves, reservoirs, and streams used for recreational purposes. In addition to the public facilities, there are many private and public fishing lakes and wild fowl hunting areas developed and maintained for such use.

To illustrate the extent of public interest in these activities, the following statistics are presented on licenses sold in Arkansas for the 1951 fiscal year:

Hunting Licenses	(Resident)	192,068
"	" ($25) (Over 12 traps)	685
"	" ($15)	4,753
Fishing Licenses	(Resident)	223,218
"	" (Non-resident)	18,867
"	" (One trip)	58,094
"	" (Commercial)	20,167

Fishing and hunting are important recreational activities in the basin. However, many people who do not participate in sports requiring licenses enjoy other forms of recreation, such as bathing, boating, and camping. Including minors and others not licensed, a large portion of the 1,909,000 people in Arkansas share in these activities.

Wild fowl including dove, quail, turkey, and other birds are hunted in the upper portion of the basin. The lower portion is in the line of flight of ducks and geese commonly referred to as the Mississippi Flyway in their seasonal migration between Canada and warmer regions. Large water-covered areas such as rice fields and lakes in the lower areas attract the birds for feeding and resting. Deer hunting is popular in many upland areas which have been stocked in recent years.

The development of recreational areas and facilities adjacent to impoundments is an important feature of projects constructed by the Corps of Engineers. It is evident from the existing and proposed recreational developments that this form of water use will become more important in the basin.

Commercial Fishing and Trapping

Most of the commercial fishing is done on the lower White River and tributaries. Commercial fishing is not permitted in the Missouri portion of the basin. The main stem is noted for its yield of mussel shells which are used in the manufacture of buttons in nearby plants.

Muskrat, mink, fox, raccoon, opossum, and other fur-bearing animals are trapped in commercial quantities and provide a significant source of income for the region.

Navigation

The White River to Guion, Arkansas, 329 miles above the mouth, is used for light navigation. Navigable use of the river consists principally of local movement of sand and gravel, and transportation of logs on the lower reaches. Recently the Federal Government discontinued the operation of the locks and dams between miles 300 and 320 because the operating costs were not justified by the amount of traffic. The City of Batesville, Arkansas, is operating and maintaining one of the locks and dams under an agreement with the United States.

Waste Disposal

The streams in the basin are used for the final disposal of municipal and industrial wastes. In several local areas the use of streams for this purpose is exploited and continues uncontrolled at the expense of the primary water uses. The equitable allocation of the waters of a river system should allow for reasonable use for final waste disposal and their use can be reconciled, generally, with the primary water uses through application of recognized pollution abatement measures solely or in combination with water resources conservation and development projects.

POLLUTION CONTRIBUTED TO WATER RESOURCES

Pollution contributed to the water resources of the basin may be listed under the following three general categories:

(1) Municipal pollution - sewage and other wastes discharged with or without treatment from public and institutional sewage collection systems.

(2) Industrial pollution - industrial production or process wastes which are discharged directly to watercourses through separate outlets.

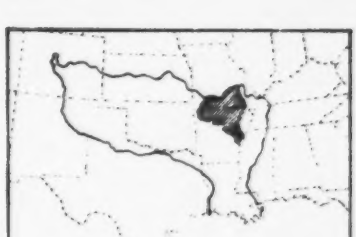
(3) Natural pollution - sediment resulting from the erosion of lands and mineralization dissolved in waters by contact with natural soluble mineral deposits.

Tables A and B summarize the available information on the extent of pollution discharged to the water resources of the White River Basin from municipal and industrial sources. Maps 2 and 3, showing the sources of municipal pollution and a general picture of industrial pollution, present a pictorial summary of the data on the extent of pollution discharged to the waters of the basin.

Table 3 shows the mean suspended sediment concentration by weight for a number of stations on the White River and tributaries.

There are 46 municipalities in the basin with populations ranging from 738 to 66,731, which are considered as sources of pollution. There is a population of 152,800 connected to sewers. Numerous plants discharging industrial wastes to the municipal sewer systems add to the domestic sewage load. The total pollution load is equivalent to the untreated wastes produced by approximately 177,000 people (population equivalent).

There are many food and kindred products industries, including canning poultry dressing, meat packing and slaughtering, and milk processing which discharge organic type wastes into municipal sewer systems in the Arkansas and Missouri portions of the basin. Data on population served and pollution discharged to watercourse include population equivalents of organic industrial wastes for the Missouri municipalities. Data on population equivalents of organic industrial wastes discharged to municipal sewers for the Arkansas municipalities are not available.



LEGEND

SOURCES OF MUNICIPAL POLLUTION

POPULATION EQUIVALENT (B.O.D.) OF WASTE DISCHARGED TO STREAM

- 500 AND UNDER
- 500–5,000
- 5,000 AND OVER

EXISTING TREATMENT FACILITIES

- MUNICIPALITIES WITH TREATMENT FACILITIES
- MUNICIPALITIES WITH NO TREATMENT FACILITIES

SCALE OF MILES

WHITE RIVER BASIN

SOURCES OF MUNICIPAL POLLUTION

AND

EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY

Public Health Service

Division of Water Pollution Control

MAP NO. 2

WHITE RIVER BASIN

SOURCES OF INDUSTRIAL POLLUTION
AND
EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY
Public Health Service
Division of Water Pollution Control
MAP NO. 3

23

TABLE NO. 3

MEAN & MAXIMUM SUSPENDED SEDIMENT CONCENTRATION

WHITE RIVER & TRIBUTARIES

Station	Watercourse	Drainage Area (sq. mi.)	Mean Sediment Concentration (p.p.m.)	Maximum* Sediment Concentration (p.p.m.)
Newport, Ark.	White R.	19,812	311**	2,320
Reeds Springs, Mo.	White R.	3,617	128**	830
Heber Springs, Ark.	Little Red R.	1,140	110	2,400
Tecumseh, Mo.	North Fork R.	561	182**	1,870
St. Joe, Ark.	Buffalo R.	825	643	2,620
Black Rock, Ark.	Black R.	7,323	175	1,540
Annapolis, Ark.	Black R.	484	156	1,470
Poughkeepsie, Ark.	Strawberry R.	476	952	3,100
Evening Shade, Ark.	Piney Fork R.	99	1,480	3,920
Doniphan, Mo.	Current R.	2,038	121	1,630

* Actual sample analysis representing mean in the cross section.
** Worked for period when both sediment and flow records available.

Other stations worked for full period of discharge records using flow duration and sediment rating curve.

NOTE: Data computed from records of the Corps of Engineers, Little Rock, Arkansas.

The amount of known pollution discharged to the watercourses of the basin from municipal sources is equivalent to the untreated wastes of about 70,000 people.

In the Arkansas portion there are 33 municipalities with populations ranging from 738 to 17,071 having sewage collection systems. Two additional cities are actively planning for the construction of community systems. Twenty-eight of the 35 have some form of sewage treatment. Approximately 86,400 people are provided with sewer service, and many small industries contribute organic and inorganic wastes to municipal sewers. Pollution load from municipal sources is reduced by about 46 percent prior to discharge into the streams.

In the Missouri portion of the basin there are 11 municipalities with populations ranging from 1,015 to 66,731 which have sewage collection systems. Eight of the municipalities have some type of sewage treatment. The population connected to sewers (66,400), plus the population equivalent of organic industrial wastes discharged to sewers, equals 90,000. Other small industries for which no data are available contribute wastes not included in the above figure. About 74 percent of the pollution load from municipal sources is removed before it is discharged to streams.

In addition to sewage from municipal sources, industrial wastes from 87 significant sources are discharged directly to streams through separate outlets. Two of the 87 are fertilizer plants producing acid wastes. The remainder are industries discharging organic wastes with a total known population equivalent of 72,000 to streams.

In the Arkansas portion of the basin, organic industrial wastes with a population equivalent of 49,000 are discharged directly to watercourses through separate outlets from a total of 69 industries which are considered as significant sources of pollution. These consist of canning, milk processing, slaughtering and meat packing, and chicken processing plants. Fifty-three of the plants, or 78 percent, are canning plants, most of which are seasonal industries, operating only a few months of the year. Canning plants considered are only those large enough to be relatively permanent in location and capable of producing a significant amount of pollution. The damage from many canning plants is important primarily as a local nuisance. However, there is evidence of the escape of some concentrated canning wastes into major streams. On the James River tomato scraps and dissolved liquids are seen downstream from canning plants. It is not known what part of the pollutional effect of the organic industrial wastes is removed before discharge to streams. Most of the milk processing plants and slaughterhouses have some form of treatment. Only a few of the many canning

plants have some type of treatment. One fertilizer plant discharges acid wastes without providing adequate treatment.

In Missouri organic industrial wastes with a population equivalent of 23,000 are discharged directly to watercourses from a total of 17 industries which are considered as significant sources of pollution. These consist of canning, milk processing, and meat packing plants. Over half of the 17 are canning plants. Only one canning plant, one cheese plant, and one packing plant of all the industries have some type of waste treatment. The remaining 14 industries discharge wastes to watercourses without treatment. One fertilizer plant discharges acid wastes without adequate treatment. Strong organic wastes from several whey products plants also present pollution problems in the Missouri portion of the basin.

Sediment pollution occurs from natural or man-made causes. Some of those causes, primarily of natural origin, are the character of surface geology and topography or the denuding land of vegetation by drought periods which permits precipitation to erode the land surface. Man-made causes of sediment pollution are important in some areas. Pollution problems presented by the glass sand and gravel excavating and working, limestone quarrying, and manganese, lead, and zinc mining and processing are recognized in the basin, but the extent of the problems is undetermined. However, streams in the basin are relatively free of sediment in comparison with other streams in the region. The Strawberry and Buffalo Rivers carry relatively heavy sediment loads compared with the main stem and other streams in the basin. Almost all of the suspended sediment load on those streams is carried at the very highest flows, thus indicating that heavy erosion carries sediment to streams. Light sediment loads carried by the Black, Current, White, and Little Red Rivers affect the primary water uses of these waters very little. Except for the Strawberry and Buffalo Rivers, suspended loads carried by streams in the White River Basin do not produce significant encroachment on impoundment storage. A sedimentation survey of Norfork Lake made in 1950, after seven years of operation, indicated practically no measurable deposits in the impoundment. Survey was made by the Corps of Engineers.

TABLE A

SOURCES OF POLLUTION

MUNICIPAL

Municipalities*	Sources of Pollution (In Number of Municipalities*)	Population Served by Sewerage System	Amount of Pollution Discharged to Watercourse (In Terms of Equivalent Number of People)
Having data on pollution load discharged to watercourse	46	152,800 1/	70,000 2/
Having population data available (Data on pollution load to watercourse incomplete or not available)	---	---	---
TOTAL	46	152,800	70,000

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers; sanitary sewage wastes discharged by industry directly into watercourse and industrial wastes discharged into municipal sewage systems.

1/ In addition to population served, a P.E. of 43,000 is discharged to municipal sewers in Missouri.

2/ Includes P.E. of organic industrial wastes discharging to municipal sewers for the Missouri municipalities. Organic industrial wastes data discharging to municipal sewers in Arkansas not available.

TABLE B

SOURCES OF POLLUTION

INDUSTRIAL

Industries	Sources of Pollution (In Number of Plants)	Amount of Pollution Discharged to Watercourse (In Terms of Equivalent Number of People)
Producing Organic Wastes	85	72,000
Producing Organic Wastes		
Producing Inorganic Wastes	2	---
Producing Wastes of Undetermined Type		
TOTAL	87	72,000

DAMAGES TO WATER RESOURCES FROM POLLUTION

Damages to water resources from pollution in the White River Basin may be considered under two general categories, namely, the existing or specific damages, and the potential damages, those which may result from the use of polluted waters. Practically all primary water uses in the basin are affected to some degree by pollution originating from municipal, industrial, or natural sources.

Waters obtained from polluted surface sources for domestic use require more extensive and expensive treatment to assure production of a potable supply for the consumer. High concentrations of bacteria, taste and odor-producing substances, and organic and inorganic chemicals affect the suitability of the water for various domestic uses and may jeopardize the health of consumers due to the ever present hazard of contamination not being completely removed from treated water. The undesirable impurities increase the amounts of chemicals, type and size of plant, and number and vigilance of employees required to assure satisfactory treatment to the finished supply. Furthermore, sediment pollution will encroach on impoundment storage.

Waters obtained from polluted surface supplies for industrial use may be subject to some or all of the detrimental effects mentioned for production of a domestic supply and possibly additional expense and risk dependent upon the quality of water required for the industrial process.

Adequate power production potential is important to the location and development of industry. Serious silt pollution could damage hydroelectric power production equipment and also encroach on impoundment storage, thus counterbalancing the many favorable factors for hydroelectric developments in this basin.

Silt pollution causes considerable damage to irrigation facilities and impoundments and may have an adverse effect on land quality. The useful life of impoundments constructed for the conservation of water is reduced by sedimentation. Although the problem is minor in most areas of the basin, it is of moderate importance in some areas. The Corps of Engineers has studied as part of the navigation plan for the Arkansas River the feasibility of providing a channel through the Grand Prairie region to the White River. This plan would permit irrigation of rice fields in the region from navigation channels. Since the Arkansas River carries a large suspended sediment load, some sediment pollution would be brought into the area.

The loss of livestock resulting from the use of polluted streams for

watering also presents a potential economic loss in this region dependent upon livestock raising for a large part of its economy.

The large and numerous lakes in the basin and the perennial flow in the streams present ideal conditions for the propagation of fish and wildlife and the pursuit of recreational activities, and thus these activities have considerable financial significance in the basin. Damage to waters which will harm aquatic life results from three main types of pollution: (1) organic pollution, originating mostly from domestic sewage and food-processing industries, reduces or depletes the oxygen content necessary for the support of fish life in the streams; (2) toxic materials, acids, and other inorganic wastes destroy fish or create an environment unsuitable for the production of water life used by fish as food; (3) sediment deposited in the watercourses covers plant and animal life used as sources of fish food and also destroys natural spawning areas. Sediment pollution presents the additional disadvantage of impairing the ability of streams to recover from organic pollution.

A number of intangible damages result from sediment and other types of pollution of streams. Aesthetic values deteriorate from the unpleasant appearance and odors from polluted rivers, lowering values of surrounding areas and affecting the enjoyment of living nearby.

As a matter of illustration and interest, a few case histories are presented. The Fayetteville, Arkansas sewage treatment plant discharges its effluent into the West Fork of White River a few hundred yards downstream from the small dam, from which a major part of the city's water supply is obtained. Organic industrial loads discharging to municipal sewers add to the difficulty of operation of the secondary treatment plant. In January and February, 1951, for an extended period, only 40 percent removal of B.O.D. was obtained. It is believed that the strong plant effluent resulted in large fish kills and presented a hazard to large livestock herds which use the stream for watering purposes.

Damages from silt pollution result when precipitation upstream from municipal water treatment plants suddenly change the turbidity, necessitating quick changes in the chemical treatment of the raw waters. The City of Searcy obtains water from Little Red River without providing artificial storage. Even though the stream's waters normally are clear, storms upstream suddenly change the water treatment problem, thus entailing more care and additional costs of chemicals.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

In a consideration of benefits resulting from pollution prevention and abatement, it can be stated generally that all legitimate water uses derive some degree of benefit, either directly or indirectly, from a program of pollution control. In a broader sense, the benefits may be applied to the conservation and development of our fundamental human, land, and water resources. In some cases the benefits can be evaluated on a monetary basis and are regarded as tangible benefits. Most generally prevailing, however, are the intangible benefits to public health, recreation, aquatic life, and purely aesthetic considerations, which are equally real and justified, but because of their nature cannot readily be assigned a specific or monetary value.

Several communities using surface waters, and a greater number using ground waters as sources for public supplies in the basin, will be confronted with critical water shortages when there is an increase in demand resulting from anticipated population growth and industrial development. Protecting the available surface waters from pollution will make them available for new sources of supply and permit optimum use for the existing supplies. Pollution abatement will also permit municipal water treatment plants now treating polluted water to operate at less cost and with a greater factor of safety from a public health standpoint.

Manufacturing enterprises have been slow to develop in the basin despite the prevalence of raw materials and other favorable factors. With the increased needs for natural resources found in the basin, and the depletion of supplies elsewhere, it should be profitable to develop sources in this area. Waters must be protected from pollution to satisfy the future needs of existing industries and the anticipated needs of future industries. Any beneficial change in the quality of water available for industrial use will decrease the cost of treatment and thus serve as a direct financial benefit and inducement to industrial expansion and development. Other direct benefits to industry often result from waste recovery measures. It has been demonstrated in numerous instances that industrial waste treatment often results in the conservation of valuable resources through re-use of raw materials or salvage of by-products. The return from the re-use or sale of recovered materials is, in many cases, a direct financial benefit to the industry or contributes to the cost of installation and operation of waste treatment facilities and also economizes natural resources.

Since the underground water level is lowering due to excessive use in areas where rice irrigation is practiced widely, surface waters

must be protected from pollution so that they can be used for irrigation or for recharging underground supplies. Control of the supply of sediment reaching watercourses of the basin in large quantities will result in many benefits to agriculture, primarily by retaining the valuable soil cover on the lands and by reducing siltation of water conservation impoundments and irrigation facilities.

Prevention and abatement of pollution will preserve the streams and lakes for continued intensive use for fishing, wildlife preservation, and recreation. Fishing as a recreational pursuit is exceptionally important throughout the basin; and commercial fishing is an important activity on the White River and tributaries in the lower portion of the basin. Many of the large lakes and rivers have extensive permanent type developments for recreation. Pollution must be prevented to preserve the use of waters for these purposes and thus avoid damage to extensive permanent developments.

POLLUTION PREVENTION MEASURES IN EFFECT

Considerable progress in providing pollution control measures for the protection of surface water resources of the basin has been made in recent years. This progress has been primarily in the field of treatment of wastes from municipalities, but some progress has been made in treatment of wastes from old industries. Most new industries are taking action to prevent pollution of streams. Several serious industrial waste pollution problems have been partially or completely corrected in recent years by construction of treatment facilities. There remain many municipal and industrial plants with unsatisfactory treatment because the design capacity or type of treatment is inadequate. Serious pollution problems are also presented by a number of municipalities and industries due to unsatisfactory operation of plants. Unsatisfactory operation results from high infiltration into sewer system, faulty plant and equipment, or from use of improperly trained personnel.

A summary of the available data on existing municipal waste treatment plants is shown in Table C. Of the 46 municipalities listed as sources of pollution, 36 provide some degree of treatment. Twenty municipalities have primary treatment plants, and 16 have secondary treatment plants. Ten have no treatment plants. Primary plants serve 34,000 persons, or 22 percent of the total sewered population of the basin; secondary plants serve 95,400 persons, or 63 percent of the total sewered population; and 23,400 persons, or 15 percent, have no waste treatment plants.

In Arkansas 19 municipalities serving 33,500 persons have primary treatment; nine municipalities serving 40,200 persons have secondary treatment; and seven municipalities serving 12,700 persons have no treatment. Two municipalities in the latter category do not have existing sewage collection systems but are actively planning to construct needed systems and primary treatment plants.

In Missouri one municipality serving 500 persons has primary treatment; seven serving 55,200 have secondary treatment; and three serving 10,700 have no treatment.

Table D shows a summary of the available data regarding existing industrial waste treatment facilities. Eighty-seven industries are considered as significant sources of pollution, discharging directly to watercourses with all but two industries producing organic wastes associated with the processing of foods and kindred products. Of these industries, 20 have some type of waste treatment; and 57 discharge wastes without treatment. Sixty-one industries are canning plants, most of which are seasonal industries, operating only a few months of the year.

In Arkansas there are 69 industries, 16 of which have some type of waste treatment. All produce organic type wastes except one, which is a fertilizer plant contributing acid wastes to the watercourse.

In Missouri there are 18 industries, four of which have some type of waste treatment. All produce organic type wastes except one, which is a fertilizer plant contributing acid wastes to the stream.

Wastes from both fertilizer plants run through broken limestone filters; some sulfuric acid and fluorides pass through the treatment facilities to the watercourse.

The adequacy of the existing municipal sewage treatment facilities is shown in Table E. Only 19, or 53 percent, of the existing municipal treatment plants are adequate as to capacity or type of treatment; 17 are inadequate. Only 19 municipal treatment plants are operated satisfactorily; 17 are operated unsatisfactorily.

In Arkansas there are 14 municipal treatment plants adequate as to type or capacity and 14 inadequate. Fourteen treatment plants are operated satisfactorily and 14 unsatisfactorily.

In Missouri there are five municipal treatment plants adequate as to type or capacity and three inadequate. Five treatment plants are operated satisfactorily and three unsatisfactorily. The adequacy of the existing industrial wastes treatment facilities is shown in Table F. The capacity or type of treatment of nine plants, or 45 percent, is inadequate; the capacity or type of treatment is inadequate for four plants and undetermined for seven. The operation of 11, or 55 percent of the plants, is satisfactory; operation of three is unsatisfactory; and of six, undetermined.

In Arkansas there are eight industrial wastes treatment facilities adequate as to capacity or type of treatment, two inadequate, and six undetermined. Nine have satisfactory operation, two unsatisfactory, and five are undetermined.

In Missouri there is one industrial waste treatment facility adequate as to capacity, two inadequate, and one undetermined. Two facilities have satisfactory operation; one unsatisfactory; and one undetermined.

Table G shows recent progress in construction of pollution abatement facilities. A total of 14 municipal treatment plants or plant improvements serving 71,200 persons were constructed in the period 1946 to early 1952. Twelve of the 14 projects serving 66,000 persons were constructed by Arkansas municipalities and the other two serving 5,200 persons were constructed by Missouri municipalities. Considerable progress is shown in this period for abatement of pollution from municipal sources.

No information is available regarding progress in construction of pollution abatement facilities for industries during the period 1946-1952. This does not mean that no facilities for treatment of industrial wastes have been constructed. It is likely that some of the industries with wastes treatment were constructed in the period, and wastes treatment facilities for older industries may have been constructed in the period.

General principles and methods for treatment of domestic wastes are somewhat standardized, but changes and improvements will be made as our knowledge on the subject increases. Although there has been advancement in the knowledge of theory, methods, and plant design for treating industrial wastes, development of technical knowledge in the field presents a challenge for the future. Research activities are being carried on in many industrial fields for gathering information on methods for treating industrial wastes.

The Federal Government recognizes that the responsibility for water pollution control rests primarily with the States, but also regards conservation of the water resources as a national concern. Federal legislation has been enacted recently to assist the States in their program activities. The provisions of the Federal Water Pollution Control Act, Public Law 845, 80th Congress, have stimulated water pollution control activities in Arkansas and Missouri by providing technical service assistance and making Federal funds available for the conduct of investigations, research, surveys, and studies related to the prevention and control of water pollution caused by industrial wastes.

Control of water pollution in Arkansas is under the jurisdiction of the Water Pollution Control Commission established within the State Board of Health by legislative action in 1949. Legislative authority delegated to the Commission is adequate for the development and administration of comprehensive pollution abatement programs in the State. Program activities carried on in cooperation with the State Fish and Game Commission are accomplishing measurable pollution abatement commensurate with funds appropriated for program activities.

In Missouri, the Division of Health exercises certain control over stream pollution through the broad powers delegated to the Director of the Department of Public Health and Welfare. Additional legislation has been under the jurisdiction of the Conservation Commission. Enforcement provisions of existing regulations and laws, however, are inadequate to support the stream pollution control agencies in their efforts to cope with pollution problems.

The State of Missouri enacted a bill effective October 9, 1951, permitting issuance of revenue bonds and the collection of a sewer service

charge to construct and maintain sewage treatment works. Since this law was enacted, a number of Missouri municipalities have initiated action to provide treatment of their wastes.

The State of Arkansas enacted a law in 1933 to permit issuance of revenue bonds and the collection of a sewer service charge to finance sewer improvements, including treatment plants.

Thus, Arkansas and Missouri have legislation providing a method of financing sewer improvements reserved for that purpose so that, if millage under other types of financing methods is exhausted for other purposes, sewage treatment improvements can be financed.

Although most of the streams in the basin are exceptionally clean from the standpoint of suspended sediment, the moderately heavy suspended sediment loads carried by a few tributaries present evidence of heavy basin erosion. Much is being done by the farmer with the cooperation of State and Federal agencies to reduce natural sources of sediment pollution. Some practices in effect which are being encouraged as regular farming practices are terracing, pasture improvement, reforestation, prevention of forest fires, gully stabilization, and stream bank protection. Reservoirs constructed on streams in the basin serve to desilt stream flows.

TABLE C

EXISTING TREATMENT FACILITIES

MUNICIPAL

Degree of Treatment Provided	Number of Municipalities* Served	Number of Treatment Plants	Population Served
Primary	20	20	34,000
Secondary	16	16	95,400
No Treatment	10	10	23,400

*Includes incorporated or unincorporated municipalities, other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, sanitary wastes discharged by industry directly to watercourse and industrial wastes discharged into municipal sewage systems.

TABLE D

EXISTING TREATMENT FACILITIES

INDUSTRIAL

Type Industry	Number of Plants	Number of Industrial Plants Having:		
		Treatment Facilities	No Treatment Facilities	Undetermined Facilities
Food & kindred products	85	18	57	10
Chemical & allied Products	2	2	0	0

TABLE E

ADEQUACY OF EXISTING TREATMENT FACILITIES
MUNICIPAL

Number of Municipal Treatment Facilities	Adequacy with Relation to:					
	Capacity			Operation		
	Satisf.	Unsatisf.	Undetermined	Satisf.	Unsatisf.	Undetermined
36	19	17	0	19	17	0

TABLE F

ADEQUACY OF EXISTING TREATMENT FACILITIES
INDUSTRIAL

Number of Industrial Treatment Facilities	Adequacy with Relation to:					
	Capacity			Operation		
	Satisf.	Unsatisf.	Undetermined	Satisf.	Unsatisf.	Undetermined
20	9	4	7	11	3	6

TABLE G

PROGRESS IN CONSTRUCTION OF POLLUTION ABATEMENT FACILITIES

Year	Municipal		Industrial	
	Sewage Treatment Plants Completed	Design Population	Waste Treatment Plants Completed	Amount of Waste Treated (In Terms of Equiv. No. People)
1946	1	16,000		
1947	None	None		
1948	None	None		
1949	1	7,000	No data available	
1950	3	15,000		
1951	5	15,200		
1952	4	18,000		

POLLUTION PREVENTION MEASURES REQUIRED

The measures required for pollution prevention and abatement expressed herein are based on information available at the writing of this report. The needs are not intended to be complete and final but are subject to changes and re-evaluation as additional data become available through continued studies and investigations.

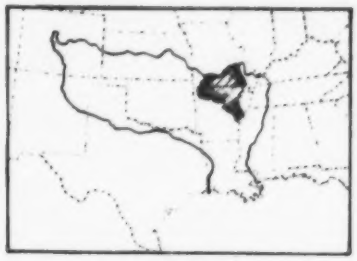
Assembling of the available data pertaining to all aspects of water pollution has exposed deficiencies and gaps in the information, especially concerning industries, and suggests a definite need and primary objective to obtain complete definition of the problems and to permit evaluation of corrective measures required for comprehensive pollution abatement.

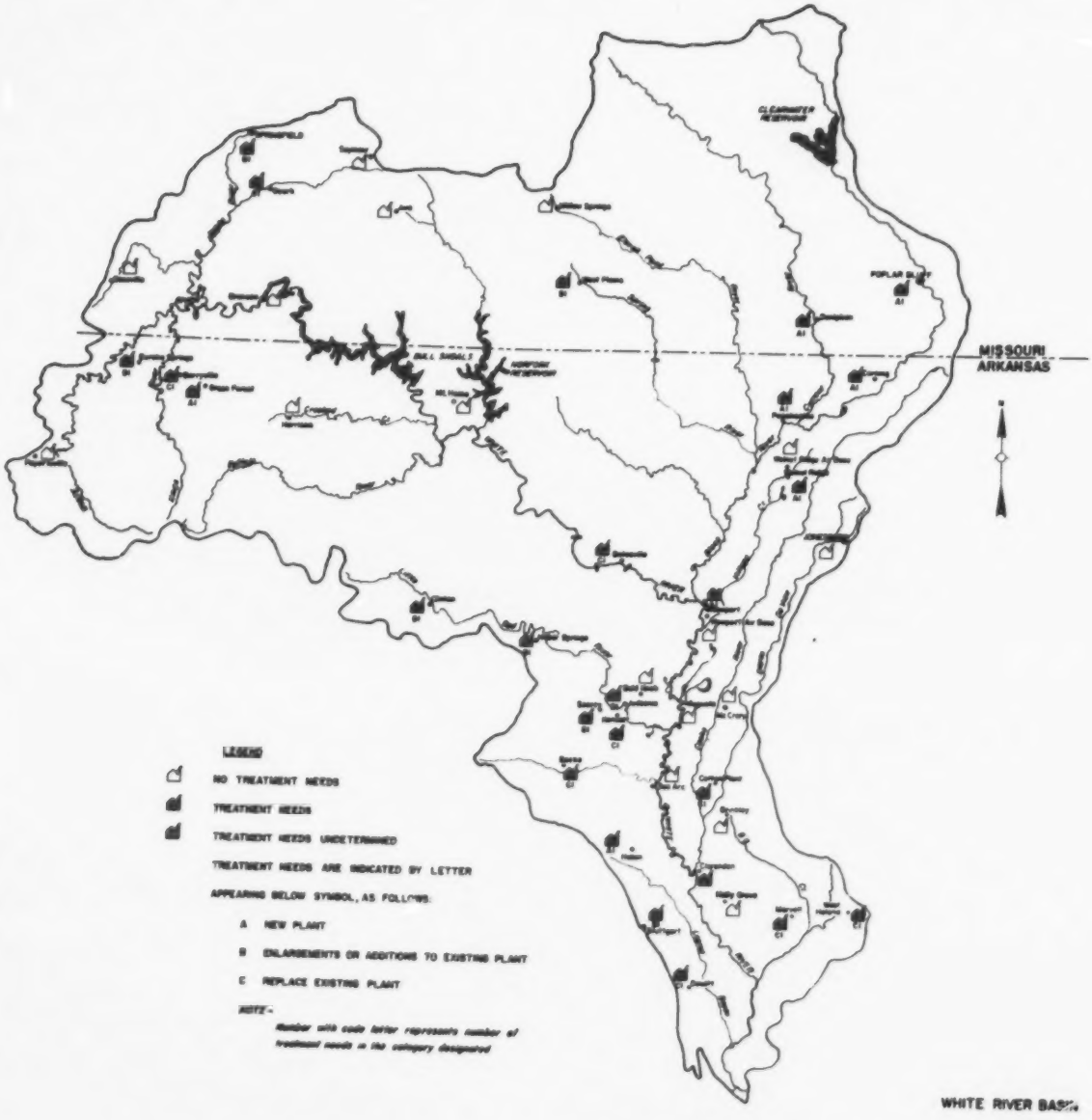
Although most of the municipalities in the basin have some type of sewage treatment plant, there is indicated an immediate need for a number of plants where no treatment is now provided and for the expansion or improvement of a substantial number of existing plants to render them adequate and effective for protection of the receiving waters.

Table H shows a summary of the municipal pollution prevention needs in the basin. Eight municipalities, with a combined sewered population of 21,200, need new plants for the treatment of wastes at present discharged raw to watercourses. This number includes two municipalities planning to construct new sewage collection systems. Eight municipalities, with a combined sewered population of 67,500, need enlargements or additions to the existing plants to increase capacities, improve operation, or to provide secondary treatment; nine, with combined sewered population of 14,700, need replacement of existing plants; 19, with combined sewered population of 47,200, require no improvements; and the needs of two municipalities serving 2,200 persons are undetermined. Map No. 4 shows the locations and needs of municipal sewage treatment facilities. Table I and Map No. 5 summarize the industrial waste pollution abatement needs. Twenty industries need new plants or other pollution control measures for the treatment of wastes. Two industries need enlargements or additions to existing plants; one needs replacement of its existing plant; eight industries require no new facilities; and the needs of 57 are undetermined.

In Arkansas four industries need new waste treatment plants; one needs an enlargement or addition; one needs a replacement; seven require no new improvements; and the needs of 56 industries are undetermined.

In Missouri 16 industries need new waste treatment plants; one needs an enlargement or improvement; one requires no improvement; and the needs for one are undetermined. One of the industries needing a





LEGEND

NO TREATMENT NEEDS

TREATMENT NEEDS

TREATMENT NEEDS UNDETERMINED

TREATMENT NEEDS ARE INDICATED BY LETTER APPEARING BELOW SYMBOL, AS FOLLOWS:

A NEW PLANT

B ENLARGEMENTS OR ADDITIONS TO EXISTING PLANT

C REPLACE EXISTING PLANT

NOTE:-

Number with each letter represents number of treatment needs in the category designated

SCALE OF MILES

0 5 0 10 20 30 40

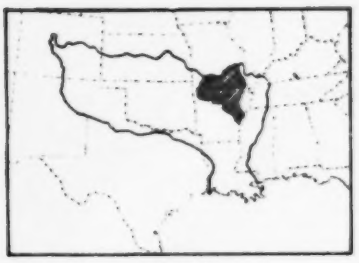
39

WHITE RIVER BASIN

MUNICIPAL

WASTE TREATMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
Division of Water Pollution Control
MAP NO. 4



MISSOURI
ARKANSAS

LEGEND

NO TREATMENT NEEDS

TREATMENT NEEDS

TREATMENT NEEDS UNDETERMINED

TREATMENT NEEDS ARE INDICATED BY LETTER APPEARING BELOW SYMBOL, AS FOLLOWS:

A NEW PLANT

B ENLARGEMENTS OR ADDITIONS TO EXISTING PLANT

C REPLACE EXISTING PLANT

NOTE—
Number with code letter represents number of treatment needs in the category designated

SCALE OF MILES
0 10 20 30 40

WHITE RIVER BASIN
INDUSTRIAL
WASTE TREATMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
Division of Water Pollution Control
MAP NO. 9

new plant, located in Mansfield, plans to connect to municipal sewers which will be constructed as a new system with sewage treatment in the near future.

Table J shows the current status of action on municipal pollution abatement needs. Seventeen municipalities have taken no action on their needed projects; three are engaged in active planning; three have final plans approved; and two have projects under construction.

In Arkansas 16 municipalities have taken no action on their needed projects; two are actively planning; and two have projects under construction. The action on the needs of Clarendon is undetermined because the necessary field studies have not been made to determine if any treatment is necessary.

In Missouri one municipality has taken no action on its needed project; one is actively planning; two have final plans approved; and one has a project under construction.

Table K shows the current status of industrial pollution abatement needs. Sixteen industries have taken no action on their needed projects; one has final plans approved; and the status of sixty-one is undetermined.

In Arkansas one industry has taken no action on its needed project and the status of sixty-two industries is undetermined.

In Missouri 15 industries have taken no action on their pollution abatement needs; one has had final plans approved; and the status of one is undetermined.

Table L lists the municipalities and the industries needing specific or undetermined types of projects. For industries discharging organic type wastes, a population equivalent based on actual data or a theoretical value computed from plant output is shown, if either data are available.

No data are available on treatment needs of the glass sand and gravel industry, limestone quarrying, and manganese, lead, and zinc mining operations.

It is estimated that the initial cost of the required municipal waste treatment facilities in the White River Basin will be approximately $2,500,000. This estimate is based on average construction costs considered reasonable for this area and includes the cost of new treatment plants, additions, and improvements to existing plants, and replacement of inadequate, obsolete, and worn-out plants. The estimate includes the cost of providing treatment for the industrial wastes discharged to municipal sewers for the Missouri portion of the basin. Data on

industrial wastes discharged to municipal sewers in the Arkanas portion of the basin are not available.

There is insufficient information available on the sources of industrial pollution and the nature and magnitude of individual and collective problems to determine the types and capacities of waste treatment facilities required. These deficiencies of information, in addition to the complexities of methods required for treatment of some industrial wastes, preclude estimating of costs of measures needed for treatment of industrial wastes.

Although most streams in the basin are relatively clean from the standpoint of suspended sediment, moderately large sediment loads are carried by a few streams. To prevent and abate the form of stream pollution occurring in the form of inorganic suspended sediment the practices such as terracing, pasture improvement, reforestation, forest fire prevention, cover improvement, gully stabilization, and stream bank protection must be expanded to include all areas. Impoundments constructed in the area serve to desilt streams. However, it is desirable to prevent sediment from entering watercourses by proper land control since this method is the cheaper cure, and in the process, it protects the land resources.

Adequate water pollution control legislation, broad in scope and containing workable enforcement provisions, is a recognized working tool for the State agency shouldered with the responsibility of abating pollution from the waters under its jurisdiction.

Water pollution control program activities in Missouri have been hampered in the past, mainly because of lack of legislative authority necessary to enforce the existing State anti-pollution regulations and laws, and partly because of insufficient funds made available to the Division of Health. Comprehensive legislation is needed in Missouri to support the designated agencies in their program activities.

Although comprehensive water pollution control legislation has been in effect in Arkansas since 1949, the program activities of the State Water Pollution Control Commission have been handicapped and delayed because of the lack of sufficient funds. The State Legislature should recognize this need and appropriate funds commensurate with the responsibilities imposed on the Commission to permit continued and expanded program activities.

An effective operating program will require adequate administrative and technical personnel, necessary equipment and facilities, and sufficient funds for all essential activities. The program objectives should accomplish, through further studies and investigations, a

comprehensive evaluation of the pollution problems, recommendations for their solution, and, finally, the active sponsoring of remedial measures required. When essential for the solution of particular industrial waste problems, cooperative investigations and research projects between the State and industry should be initiated by the responsible water pollution control agency.

The need for the support of the public and the leaders of industry is essential for the advancement of an effective water pollution control program. Although the public is generally aware of pollution locally, the majority are not fully aware of the extent of pollution, of the damages resulting from pollution to all water uses, of the potential damage to existing downstream activities if pollution conditions are aggravated, or of the benefits accruing from restoration and protection of the waters for productive uses. A State program of public education reaching citizens in all walks of life would serve to create greater public demand and cooperation for pollution abatement measures.

TABLE H

WASTE TREATMENT NEEDS - MUNICIPAL

Needs	Number	Population Served by Facilities
New Plant	8	21,200
Enlargement or Additions to Existing Plant	8	67,500
Replace Existing Plant	9	14,700
No Project Required	19	47,200
Undetermined	2	2,200

TABLE I

INDUSTRIAL WASTE POLLUTION ABATEMENT NEEDS

Needs	Number
New Treatment Plant or other Pollution Control Measures	20
Enlargement or Additions to Existing Plant	2
Replace Existing Plant	1
Connection to Municipal Sewer System	-
No Project Required	8
Undetermined	57

TABLE J

CURRENT STATUS OF ACTION ON

MUNICIPAL POLLUTION ABATEMENT NEEDS

Status of Action	Number of Municipalities
Inactive	17
Active Planning	3
Final Plans Approved	2
Under Construction	3

TABLE K

CURRENT STATUS OF ACTION ON

INDUSTRIAL POLLUTION ABATEMENT NEEDS

Status of Action	Number of Industries
Inactive	16
Active Planning	0
Final Plans Approved	1
Under Construction	0
Undetermined	62

TABLE L

MUNICIPALITIES AND INDUSTRIES NEEDING IMPROVEMENTS FOR ABATEMENT OF POLLUTION

Name and Location	Population* Served	Improvements Needed **	Remarks
ARKANSAS			
Municipalities			
Batesville	4,000	R	
Beebe	700	R	
Berryville	850	R	
Clarendon	2,200	Und.	
Clinton	150	E-A	
Corning	500	NP (sec.)	
Cotton Plant	800	R	
De Witt	2,200	R	
Eureka Springs	1,900	E-A (sec.)	Active planning
Green Forest	738	NP	Collection system & treatment plant under construction
Hazen	1,270	NP	Collection system & treatment plant under construction
Heber Springs	1,100	E-A	
Judsonia	900	E-A	
Kensett	350	R	
Marvell	800	R	
Newport #1	4,000	NP (prim.)	
Pocahontas	2,500	NP (prim.)	
Searcy	4,200	E-A (sec.)	Enlarged primary 1951
Stuttgart	5,700	E-A	Under construction
Walnut Ridge	1,500	NP (prim.)	
West Helena	4,500	R	
Industries			
Alabam 1 canning company	Und.	Und.	
Alpena 1 canning company	Und.	Und.	
Baldwin 1 canning company	1,100	Und.	Tomatoes
Barton 1 canning company	400	Und.	Beans, sausage, spinach, greens
Batesville 1 slaughter house	100	Und.	

TABLE L cont'd

MUNICIPALITIES AND INDUSTRIES NEEDING IMPROVEMENTS FOR ABATEMENT OF POLLUTION

Name and Location	Population* Served	Improvements Needed**	Remarks
Blue Eye	1,800	Und.	
2 canning plants			Tomatoes, berries
Burlington	600	Und.	
1 canning plant			Tomatoes
Capps	800	Und.	
1 canning company			Beans, tomatoes
Carrolton	150	Und.	
1 canning company			Tomatoes
Clinton	Und.	Und.	
1 poultry dressing plant			
Concord	Und.	Und.	
1 poultry dressing plant			
Delaney	2,400	Und.	
1 canning plant			Tomatoes
Dinsmore	350	Und.	
1 canning plant			Tomatoes
Dry Fork	400	NP	
1 canning plant			Tomatoes
Elkins	6,200	Und.	
2 canning plants			Tomatoes
Fallsville	900	Und.	
1 canning plant			Tomatoes
Fayetteville	400	NP	
1 canning plant			Tomatoes
George	150	Und.	
1 canning plant			Tomatoes
Green Forest	1,100	Und.	
2 canning plants			Tomatoes
Harriet	500	Und.	
1 canning plant			Tomatoes
Harrison			
1 poultry dressing plant	Und.	Und.	
1 canning plant	Und.	Und.	
Hindsville	6,100	Und.	
2 canning plants			Tomatoes, beans
Huntsville	3,500	Und.	
6 canning plants			Tomatoes, blackberries
Japton	1,850	Und.	
3 canning plants			
Jonesboro	100	NP	
1 slaughterhouse			
Kingston	200	Und.	
1 canning plant			Tomatoes
Mammoth Springs	7,500	Und.	
1 poultry dressing plant			

TABLE L cont'd

MUNICIPALITIES AND INDUSTRIES NEEDING IMPROVEMENTS FOR ABATEMENT OF POLLUTION

Name and Location	Population* Served	Improvements Needed**	Remarks
Metalton	900	Und.	
3 canning plants			Tomatoes
Monarch	800	Und.	
1 canning plant			Tomatoes
Oak Grove	500	Und.	
1 canning plant			Tomatoes
Olvey	800	Und.	
1 canning plant			Tomatoes
Omaha			
1 canning plant	Und.	Und.	Tomatoes
1 canning plant	400	NP	Tomatoes
Patrick	700	Und.	
1 canning plant			Tomatoes
Pettigrew	700	Und.	
1 canning plant			Tomatoes
Pindall	350	Und.	
1 canning plant			Tomatoes
Rudd	1,200	Und.	
3 canning plants			Tomatoes
Rule	50	Und.	
1 canning plant			Tomatoes
Searcy	35	R	Connect to city sewers
1 poultry dressing plant			
Wesley	1,700	Und.	
2 canning plants			Tomatoes
West Fork	400	Und.	
1 canning plant			Tomatoes
Zack			
1 canning plant	Und.	Und.	
Zinc	600	Und.	
1 canning plant			Tomatoes
Walnut Ridge Air Base			
1 fertilizer plant	Acid wastes	E-A	Wastes run through limestone filter.
MISSOURI			
Municipalities			
Doniphan	700	NP (prim.)	
Ozark	499	R	Plans approved
Poplar Bluff	10,000	NP (sec.)	Plans approved
School of the Ozarks	Undetermined		
Springfield (S...plant)	51,000 1/	E-A	Active planning
West Plains	2,500 2/	E-A	Under construction

1/ In addition to population served, a P.E. of 18,490 is contributed to sewers from industries making a total P.E. of 69,490.

2/ In addition to population served, a P.E. of 1,560 is contributed to sewers from industries making a total P.E. of 4,060.

TABLE L cont'd

MUNICIPALITIES AND INDUSTRIES NEEDING
IMPROVEMENTS FOR ABATEMENT OF POLLUTION

Name and Location	Population* Served	Improvements Needed**	Remarks
MISSOURI			
Industries			
Abesville			
1 canning company	Lagooned	- none to stream	
Ava			
1 milk products company	410	NP	Inactive
1 foods company	1,080	NP	Inactive
Bradleyville	320	NP	Inactive
1 cheese company			
Cape Fair	1,800	NP	Inactive
1 canning company			
Crane	4,500	NP	Inactive
1 canning company			
Gainesville	720	NP	Inactive
1 cheese company			
Galena	3,000	NP	Inactive
1 canning company			
Hollister	500	NP	Inactive
1 canning company			
Jenkins	1,500	NP	Inactive
1 canning company			
Koshkonong	560	NP	Inactive
1 cheese company			
Mansfield	800	NP	Active planning
1 cheese company			
Nixa			
1 cheese company	3,600	NP	Construct joint treatment facilities
1 whey products company			
Ozark	1,650	NP	Active planning
1 cheese company			
Poplar Bluff	960	NP	Inactive; discharged to Black River
1 meat packing company			
Reeds Springs	3,000	NP	Inactive
1 canning company			
Springfield	Inorganic	E-A	Sulphuric acid and fluorides escape to streams
1 fertilizer company			
Thayer	600	NP	Inactive
1 cheese company			

* For industries the organic waste load is expressed as population equivalent as measured by B.O.D. Municipal data for Arkansas represents population only; municipal data for Missouri includes population equivalent of industrial wastes.

** R - Replacement of Existing Plant; E-A - Enlargement or Addition to Existing Plant; NP - New Plant; Und. - Undetermined.

Table 1a
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
WHITE RIVER BASIN
September, 1952

Watercourse -- Municipality	River Mile*	Population Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	Adequacy of Treatment Facilities		P.E. (B.O.D.) Disch'd to Watercourse	Treatment Needs**	Current Status Municipal Action
					Cap'y	Opr.			
WHITE RIVER									
West Fork	684.6								
Fayetteville, Ark.	3.5	13,500	13,500	Sec.	Sat.	Sat.	4,900A	None	Plant addition 1946; DP 16,000; cost, $116,000
Leatherwood Cr.									
Town Branch									
Eureka Springs, Ark.		1,900	1,900	Sec.	Unsat.	Unsat.	1,500A	E-A	Active planning
Kings River	572.4								
Osage Cr.									
Cedar Cr.									
Berryville, Ark.		850	850	Pri.	Unsat.	Unsat.	600	R	Inactive
James River	549.8								
Wilson Cr.									
Springfield, Mo. (S.W. Plant)		51,000	69,490	Sec.	Unsat.	Sat.	11,100	E-A	Active planning; DP 70,000
Finley Cr.									
Seymour, Mo.		300	720	Sec.	Sat.	Sat.	70	None	Built 1951; DP 1,200; cost, $120,000
Ozark, Mo.		490	490	Pri.	Unsat.	Unsat.	368	R	Plans approved
Flat Cr.									
Cassville, Mo.		300	1,000	Sec.	Sat.	Unsat.	100	None	DP 600
Long Cr.									
Yocum Cr.									
Green Forest, Ark.		738	738	None			---	NP (prim.)	Collection system & treatment plant to be constructed

Table 1a (Cont'd)

Watercourse -- Municipality	River Mile*	Population Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	Adequacy of Treatment Facilities		P.E. (B.O.D.) Disch'd to Watercourse	Treatment Needs**	Current Status Municipal Action
					Cap'y	Opr.			
School of the Ozarks (Hollister, Mo.)		Undetermined						Und.	
Branson, Mo.	520.4	400	1,100	Sec.	Sat.	Sat.	330	None	DP 1,000
Crooked Cr.	394.9								
Harrison, Ark.		3,000	3,000	Sec.	Sat.	Sat.	750	None	Built 1949; DP 7,000; cost, $100,000
Big Cr.									
Mountain Home, Ark.		2,500	2,500	Sec.	Sat.	Sat.	400	None	
North Fork	376.4								
Bryant Cr.									
Hunter Cr.									
Ava, Mo.		300	1,660	Sec.	Sat.	Sat.	170	None	DP 1,500
North Fork Dam & Reservoir									
Batesville, Ark.	300.1	4,000	4,000	Pri.	Unsat.	Unsat.	2,800	R	Inactive
Black River	264.8								
Poplar Bluff, Mo.	210.9	10,000	10,000	None			10,000	NP	Plans approved
Current River	96.2								
Doniphan, Mo.	51.3	700	700	None			700	NP (prim.)	
Spring River	72.0								
Warm Fork	56.3								
West Plains, Mo.		2,500	4,060	Sec.	Unsat.	Sat.	810	E-A	Under construction; DP 4,000
Eleven Point River	3.6								
Willow Springs, Mo.		400	1,200	Sec.	Sat.	Unsat.	240	None	DP1,800
Strawberry River									
Creek									
Corning, Ark.	152.2	500	500	None			500	NP (sec.)	Inactive
Pocahontas, Ark.	90.1	2,500	2,500	None			2,500	NP (prim.)	Inactive
Newport #1	257.6	4,000	4,000	None			4,000	NP (prim.)	Inactive
Village Cr.	250.6								

Table 1a (Cont'd)

Watercourse -- Municipality	River Mile*	Population Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	Adequacy of Treatment Facilities		P.E. (B.O.D.) Disch'd to Water-course	Treatment Needs**	Current Status Municipal Action
					Cap'y	Opr.			
Coon Cr.									
Walnut Ridge Air Base		1,000	1,000	Sec.	Sat.	Sat.	250	None	
Walnut Ridge, Ark.		1,500	1,500	None			1,500	NP (prim.)	Inactive
Newport Air Base		1,400	1,400	Sec.	Sat.	Sat.	350	None	
East Newport, Ark.		2,000	2,000	Pri.	Sat.	Sat.	1,300	None	Built 1951; DP, 3,500; cost, $55,000
Augusta, Ark.	206.2	1,200	1,200	Pri.	Sat.	Sat.	850	None	Built 1950; DP, 3,500; cost, $55,000
Little Red River	182.6								
South Fork	104.4								
Archey Cr.									
Clinton, Ark.		150	150	Pri.	Unsat.	Unsat.	100	E-A	Inactive
Sulphur Cr.									
Heber Springs, Ark.		1,100	1,100	Pri.	Unsat.	Sat.	800	E-A	
Town Cr.									
Gin Cr.									
Searcy, Ark.		4,200	4,200	Pri.	Unsat.	Sat.	2,900	E-A (needs secondary)	Inactive; primary addition 1950; DP, 9,000; cost, $45,000
Judsonia, Ark.	25.2	900	900	Pri.	Unsat.	Unsat.	650	E-A	Inactive
Black Cr.									
Kensett, Mo.		350	350	Pri.	Unsat.	Unsat.	250	R	Inactive
Gum Cr.									
Bald Knob, Ark.		1,000	1,000	Sec.	Sat.	Sat.	200	None	New secondary plant 1951; DP, 3,000; cost, $100,000
Bayou Des Arc	149.3								

Table 1a (Cont'd)

Watercourse -- Municipality	River Mile*	Population Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	Adequacy of Treatment Facilities		P.E. (B.O.D.) Disch'd - to Watercourse	Treatment Needs**	Current Status Municipal Action
					Cap'y	Opr.			
Cypress Bayou									
Beebe, Ark.		700	700	Pri.	Unsat.	Unsat.	500	R	Inactive
Benine Cr.									
Des Arc, Ark.		1,200	1,200	Pri.	Sat.	Unsat.	800	None	
Wattensaw Bayou	132.8								
Hurricane Cr.									
Little Hurricane Cr.									
Hazen, Ark.		1,270	1,270	None			---	NP	New collection system with primary treatment plant under construction
Cache River	101.2								
McCrory, Ark.		900	900	Sec.	Sat.	Sat.	300	None	Built 1951; DP, 1,500; cost, $50,000
Bayou DeView	10.0								
Jonesboro, Ark.		15,000	15,000	Sec.	Sat.	Sat.	3,800	None	
Turkey Cr.									
Cotton Plant, Ark.		800	800	Pri.	Unsat.	Unsat.	600	R	Inactive
Brinkley, Ark.		2,300	2,300	Pri.	Sat.	Sat.	1,600	None	Addition 1951; DP 6,000; cost, $30,000
Clarendon, Ark.	100.1	2,200	2,200	None			2,200	Und.	
Dials Cr.									
Holly Grove, Ark.		500	500	Pri.	Sat.	Sat.	350	None	Inactive
Big Cr.	51.9								
Marvell, Ark.		800	800	Pri.	Unsat.	Unsat.	600	R	Inactive
Beaver Bayou									
Ditch									
West Helena, Ark.		4,500	4,500	Pri.	Unsat.	Unsat.	3,200	R	Inactive

Table 1a (Cont'd)

Watercourse -- Municipality	River Mile*	Population Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	Adequacy of Treatment Facilities		P.E. (B.O.D.) Disch'd to Water-course	Treatment Needs**	Current Status Municipal Action
					Cap'y	Opr.			
Lick Cr.									
Corney Cr.									
Ditch									
West Helena	Air Base	Population small at present		Pri.	Sat.	Unsat.	---	None	Airbase inactive
Lagrue Bayou									
Little Lagrue Bayou									
Stuttgart		5,700	5,700	Pri.	Unsat.	Unsat.	4,000	E-A	Under construction; DP 11,000; cost, $100,000
De Witt		2,200	2,200	Pri.	Unsat.	Unsat.	1,500	R	Inactive

* River mile above mouth of White River.
** E-A - Enlargement or Addition to existing plant
R - Replacement of existing plant
NP - New plant
Und. - Undetermined

54